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F/SER3:LEB:mdh

MEMORANDUM FOR: F/SE - Joseph E. Powers

FROM: F/SER3 - Georgia Cranmore

SUBJECT: Biological Opinion on the U.S. Army Corps of Engineers
Maintenance Dredging of the Ports and Intracoastal Waterway
within the Range of Johnson's Seagrass - Adoption of the September
1, 1998, Conference Opinion (F/SER/2000/01199)

The attached biological opinion is submitted for your consideration. On September 1, 1998, NMFS Southeast Region issued a conference opinion to the U.S. Army Corps of Engineers, Jacksonville District, on maintenance dredging of the ports and intracoastal waterway within the range of Johnson's seagrass, which at the time was proposed for listing as threatened under the Endangered Species Act. Since the final listing of Johnson's seagrass on September 14, 1998, and designation of Johnson's seagrass critical habitat on May 5, 2000, there have been no significant changes in the activity evaluated in the conference opinion, or in the information used in its development. The conference opinion is therefore adopted as the biological opinion. The attached opinion is noncontroversial and states our belief that the activity is not likely to jeopardize the continued existence of any listed species or result in destruction or adverse modification of designated critical habitat for Johnson's seagrass. Recommendations to protect Johnson's seagrass are included.

Please contact Layne Bolen (850-234-6541, Ext. 237) if you have any questions, require additional information, or if there is anything she can do to assist in the review of this opinion.

Attachment

cc: F/PR3

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F/SER3:LEB:mdh

Colonel Joe R. Miller, USA
District Engineer
Jacksonville District
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Colonel Miller:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion on maintenance dredging of the ports and intracoastal waterway (IWW) within the range of Johnson's seagrass (*Halophila johnsonii*) as adopted from the September 1, 1998, conference opinion of the same title. The review of this action and its effects on Johnson's seagrass are in accordance with section 7 of the Endangered Species Act of 1973 (ESA) as amended. Also enclosed are the "Recommendations for Sampling for Johnson's Seagrass" at a project site as developed by the Johnson's Seagrass Recovery Team (including Army Corps of Engineer [COE] representative Steve Traxler), and the final notice for Johnson's seagrass critical habitat.

This biological opinion is based on information provided in the COE's Biological Assessment (July 1998); several telephone conversations with the COE (June 1998-January 2000); state of Florida (June 1998-August 1998) and Florida Inland Navigation District (January 4, 2000); a July 20, 1998, meeting with the COE and representatives from the Florida Fish and Wildlife Conservation Commission (FFWCC); a November 2, 1998, letter from the COE, Jacksonville District, Planning Division; a November 6, 1999, letter from NMFS, Protected Resources Division (PRD), to COE, Jacksonville District; a February 22, 2000, meeting between NMFS/PRD and COE Planning and Regulatory representatives; survey guidelines and recommendations developed by the Johnson's Seagrass Recovery Team from February 1999-January 2000; and updated species status reviews and field surveys. A complete administrative record of this consultation is on file at the NMFS, Southeast Regional Office.

After reviewing the current status of Johnson's seagrass, the environmental baseline for the action area (which is the range of the species), the effects of maintenance dredging of coastal navigation projects, and the cumulative effects, it is NMFS' opinion that the action, as described, is not likely to jeopardize the continued existence of the species and is not likely to destroy or adversely modify Johnson's seagrass critical habitat. Some effects to Johnson's seagrass, including effects to important characteristics of designated critical habitat, may be caused by sloughing, turbulence, turbidity, damage caused by pipeline placement, and changes in flow due to maintenance dredging.

The conclusions of this biological opinion are based on general observations of the nature of Johnson's seagrass, trends in certain transect surveys, the recently conducted transect surveys of parts of the IWW in Palm Beach County, and an overall analysis of the overall abundance of seagrasses within the range of Johnson's seagrass. Given the scarcity of precise information on the effects of ongoing maintenance dredging on Johnson's seagrass, continued and improved monitoring of dredging sites prior to (and, as feasible, after) the maintenance dredging projects is necessary to confirm our determinations.

NMFS strongly urges the COE to incorporate pre- and post-seagrass monitoring into their planning and regulatory review processes using a survey protocol designed to identify the distribution and abundance of Johnson's seagrass in an action area. Under 50 CFR 402, Federal action agencies must consult in order for NMFS to assess impacts (including cumulative impacts) to listed species and critical habitat in order to make a determination of jeopardy and to provide recommendations for avoiding or minimizing impacts to the species or adverse modification of its habitat. The total quantity of Johnson's seagrass lost can only be calculated when information on its distribution and abundance in an action area is determined. Pre-dredging seagrass surveys for the maintenance dredging projects considered in this biological opinion will allow the COE, NMFS, and the state of Florida to quantify the impacts of maintenance dredging on the species, including cumulative impacts.

We look forward to further cooperation with you on other COE projects to ensure the conservation and recovery of our threatened and endangered marine species. Please call Georgia Cranmore, Acting Assistant Regional Administrator for Protected Resources (727-570-5312), if you have any questions about the enclosed biological opinion.

Sincerely,

Joseph E. Powers, Ph.D.
Acting Regional Administrator

Enclosures

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Endangered Species Act - Section 7 Consultation

Agency: U.S. Department of the Army
Jacksonville District Corps of Engineers

Activity: Maintenance Dredging of the Ports and Intracoastal
Waterway within the Range of Johnson's Seagrass

Consultation Conducted By: National Marine Fisheries Service
Southeast Region

Date Issued: _____

Approved By: _____
Joseph E. Powers, Ph.D.
Acting Regional Administrator

Introduction:

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) on maintenance dredging of the ports and intracoastal waterway (IWW) within the range of Johnson's seagrass, *Halophila johnsonii*, and its effects on the species, as adopted from the September 1, 1998, conference opinion of the same title. This Opinion is based on information provided in the Army Corps of Engineers' (COE) Biological Assessment (July 1998); several telephone conversations with the COE (June 1998-January 2000), state of Florida (June 1998-August 1998) and Florida Inland Navigation District (January 4, 2000); a July 20, 1998, meeting with the COE and representatives from the Florida Fish and Wildlife Conservation Commission (FFWCC); a November 2, 1998, letter from the COE, Jacksonville District, Planning Division; a November 6, 1999, letter from NMFS, Protected Resources Division (PRD) to COE Jacksonville District; a February 22, 2000, meeting between NMFS/PRD and COE Planning and Regulatory representatives; survey guidelines and recommendations developed by the Johnson's Recovery Team from February 1999-January 2000; and updated species status reviews and field surveys (Kenworthy *et al.*, 1999, Virnstein *et al.*, 1999).

A section 7 conference can be conducted (and a "conference" opinion written) based on a determination that an action may affect a *proposed* species or critical habitat even if jeopardy or adverse modification are not likely. Essentially, a section 7 conference includes any formal or informal discussions between action agencies and NMFS regarding the impact of an action on proposed species or critical habitat, and recommendations to minimize or avoid adverse effects. After final listing, a conference opinion can be adopted as a formal biological opinion (50 CFR 402.10(d)).

The September 1, 1998, conference opinion identified at an early planning stage potential conflicts between Federal agency actions for the maintenance dredging of Atlantic IWW and ports on the listed species and its proposed critical habitat at an early planning stage. The conference opinion was used to develop monitoring methods and to improve these methods' assessment of impacts of ongoing actions on proposed species or critical habitat. The present Opinion, modified from the conference opinion, is based on continued consultations with the COE, updated information on the species, the development of survey recommendations by the Johnson's Seagrass Recovery Team, and the final designation of critical habitat since the time of listing.

Section 9 of the Endangered Species Act of 1973 (ESA) prohibits certain activities that directly or indirectly affect *endangered* species and these prohibitions apply automatically to endangered species. While this is not the case for *threatened* species, any or all of the prohibitions of section 9 may be extended to threatened species pursuant to section 4(d) of the ESA. NMFS may issue protective regulations pursuant to section 4(d) for Johnson's seagrass in a separate rulemaking process. Until such time, however, incidental take statements with reasonable and prudent measures will not be included in biological opinions on Johnson's seagrass. Therefore, the incidental take statement with reasonable and prudent measures that would have been developed from the conference opinion is now reflected as conservation recommendations in this biological opinion.

BIOLOGICAL OPINION

I. Consultation History

During 1995, NMFS conferred with the COE on three dredging projects and concluded that they were not likely to jeopardize the continued existence of Johnson's seagrass and/or destroy or adversely modify proposed critical habitat for the species. Previous consultations on dredging in the southeast Atlantic coastal United States determined that in most cases pipeline and clamshell dredging were not likely to adversely affect listed species, but hopper dredging could result in lethal takes of threatened and endangered sea turtles. Programmatic consultations on the effects of hopper dredging in channels and borrow areas between North Carolina and Key West, Florida, on listed species were conducted beginning in 1989. The November 25, 1991, programmatic Regional Biological Opinion to the COE considered the effects of clamshell, pipeline, and hopper dredging (maintenance and new construction) in U.S. channels along the southeastern Atlantic seaboard from North Carolina to Cape Canaveral, Florida.

Subsequent to the 1991 Opinion, *Halophila johnsonii* was proposed for listing under the ESA as "threatened." In the programmatic Regional Biological Opinion issued on August 25, 1995, to the COE's South Atlantic Division on hopper dredging of channels and borrow areas in the southeastern United States from North Carolina the through Florida East Coast, NMFS determined that there was insufficient information at that time to conduct a conference on the effects of dredging on Johnson's seagrass, a proposed threatened species. Therefore, NMFS recommended that the COE evaluate the collective impact of all dredging projects within the Florida IWW

system on Johnson's seagrass. When the NMFS, responding to increased take levels of listed sea turtles by COE hopper dredges, issued a new Regional Biological Opinion on September 25, 1997, to the COE on hopper dredging of channels and borrow areas in the southeastern United States from North Carolina through the Florida East Coast, Johnson's seagrass had still not been listed. Thus, an analysis of dredging effects on Johnson's seagrass was not included in that Opinion.

The COE, NMFS, and interested state of Florida personnel met on July 20, 1998, to discuss the effects of maintenance dredging on Johnson's seagrass. The COE submitted an undated biological assessment in July 1998, initiating a formal conference on Johnson's seagrass. The formal conference opinion was completed in September 1998. It was expected to be adopted as the formal biological opinion once Johnson's seagrass was listed or critical habitat was designated if no significant new information was developed during final rulemaking and if there were no significant changes to the COE's maintenance dredging projects described in the conference opinion.

In a November 2, 1998, letter the COE stated its willingness to accept the conference opinion as a formal biological opinion and stated that their agency had begun developing a seagrass sampling protocol. According to the letter, the COE would conduct surveys "to the extent practicable" for those projects considered in the conference opinion and plan to conduct seagrass surveys for all dredging activities not considered in the conference opinion including inlets or other sheltered coastal waters under 10 feet deep. In this same letter, the COE stated that their agency would evaluate the potential impact of other activities (fresh water releases from Lake Okeechobee and dock/marina permits) on the species.

NMFS replied to the COE in a November 6, 1998, letter stating that the request to adopt the conference opinion as the formal biological opinion would be held in abeyance until the COE had finalized and submitted the pre- and post-survey dredging survey protocol to NMFS, at which time NMFS would "formally" confirm the conference opinion as the biological opinion, provided no significant new information or changes have occurred.

Within the last year, the Johnson's Seagrass Recovery Team, which includes a COE representative, developed survey guidelines for Johnson's seagrass at various-sized project/permit sites (Attachment 1). On February 22, 2000, the COE and NMFS met to discuss conditions for adopting the conference opinion as a formal biological opinion, including monitoring guidelines for maintenance dredging projects. The COE and NMFS/PRD agreed that there would be pre-dredging seagrass surveys for those maintenance dredging projects considered in this Opinion in order to assess the presence of Johnson's seagrass and consequent impacts, but that post-monitoring of these projects would not be necessary (see Section V: Effects of the Action). NMFS made those guidelines, developed by the Recovery Team, available to the COE for their review and adoption.

II. Description of the Proposed Action

This Opinion considers the effects of maintenance dredging conducted or permitted by the COE in inshore waters from Sebastian Inlet through central Biscayne Bay on Johnson's seagrass and its designated critical habitat. The activities considered include maintenance dredging of coastal navigation projects and activities authorized by COE regulatory permits for smaller commercial and public projects. A separate consultation must be done to consider the effects of new dredging within the range of Johnson's seagrass. For the purpose of this Opinion, NMFS considers new dredging to include removal of sediments in areas that have not been dredged within the past ten years, including first-time dredging to authorized depths, as well as widening and deepening projects.

Coastal navigation projects

There are a number of coastal navigation projects from Biscayne Bay through Sebastian Inlet (Table 1). Navigation projects may be conducted by the COE, or may be conducted by a county, city, or port after receipt of a COE regulatory permit. Projects include portions of the IWW and harbors along the waterway. All of the coastal navigation sites within the range of Johnson's seagrass that are dredged regularly or are currently in need of dredging are identified in the attached table. Projects adjacent to, within, or including portions of areas designated as critical habitat are identified. The projects or portions of the projects dredged regularly and within the last ten years are those identified as maintenance projects, and include the IWW near Bakers Haulover Inlet, Hillsboro Inlet, the IWW near Jupiter Inlet, the IWW near Palm Beach Harbor (has been maintained but not to authorized depth), Palm Beach Harbor, the IWW near St. Lucie Inlet, St. Lucie Inlet, and Fort Pierce Harbor.

Pipeline or clam shell dredges are primarily used for the above-listed maintenance dredging projects. The hopper dredge is used in waters over 25 feet, principally inlets, partly because the large size and draft of commercial hopper dredges preclude their use in the shallower, more constricted navigable waterways of the IWW. Thus, it is unlikely that Johnson's seagrass would be directly impacted by hopper dredging activity since Johnson's seagrass is depth-limited and is not found over 25 feet deep. It might be present in the shallow waters adjacent to and along the edges of maintained channels and could be impacted by sloughing of the sides and edges of these channels. According to the COE (Dugger pers. comm., 2000), hopper dredges are likely to be used in portions of the Miami Harbor, Port Everglades, Palm Beach Harbor, and the Fort Pierce Harbor maintenance projects where water depths exceed 25 feet and economic and safety considerations dictate their use.

Surveys for Johnson's seagrass will be needed and section 7 consultation must be conducted for construction of the new dredging projects identified on the attached list that may affect Johnson's seagrass. New dredging anticipated in the immediate future is the IWW in the vicinity of Palm Beach Harbor. The COE is currently evaluating the effects of dredging the 2 to 10 miles of the IWW in this area to the permitted project depth (from 12 ft to 15 ft). In January 2000, the COE completed a marine seagrass survey of the Atlantic IWW in Palm Beach County from north of the Jupiter Inlet to just south of the Lake Worth Inlet (COE, 2000). Prior to dredging and construction, the location and abundance of Johnson's seagrass in the project area and expected

impacts to the species will be determined, and a consultation specific to that project will be conducted.

Regulatory permit actions

From 1982 to 1998, 349 permits, including some for coastal navigation projects, were issued for private, commercial, and public facilities that may require regular dredging within the range of Johnson's seagrass. There is no information to determine how often dredging is conducted at most of these sites. There have been a total of 880 individual permits (IPs) or letters of permission (LOP) issued by the COE between 1995 and 1998 in the range of Johnson's seagrass. These permits include the following work types: piers (residential and commercial), dredging, minor structure construction, marinas, shoreline protection, and boat ramps (public and private). Applicants requesting permits that may affect seagrasses are required to submit information regarding the level of effects likely and compelling justification for the project under the state requirements described below. Although the amount or extent of seagrass or submerged lands impacted by an IP or LOP permit is currently not recorded in the COE's permit file database, it is expected that this information will be incorporated into that database for use in determining cumulative impacts.

Dredging conditions established to minimize effects on seagrasses

Since at least 1981, the FFWCC manages and regulates all activities that affect seagrasses, including those activities permitted, conducted, or funded by the COE. The FFWCC must manage state-owned lands to maintain essentially natural conditions (Florida Administrative Code (F.A.C.) Section 18-21.004(2)). Under this authority, FFWCC or the Water Management Districts may issue permits for activities that are covered under COE general permits and are therefore not included within the projects discussed above. The FFWCC also restricts activities in areas that have received special designations, such as Outstanding Florida Waters, Aquatic Preserves, or the Florida Keys. Certain activities are prohibited over grassbeds in these areas, or special construction criteria to minimize long-term impacts are required. FFWCC requires permit applicants to demonstrate that their activities will not be harmful to water resources, and provide reasonable assurance that state water quality standards will not be violated and that the project is not contrary to the public interest. If impacts are proposed, the applicant is required to implement practicable design modifications to avoid or minimize impacts. Therefore, the COE's coastal navigation and regulatory permit maintenance dredging projects must be conducted in a manner that does not affect, or minimizes effects on all seagrasses. If there are still unpermittable impacts after the reduction and elimination process, then either a mitigation proposal must be made and evaluated or the application must be denied based on the unpermittable impacts. Often, seagrass transplantation is offered as a mitigation proposal to offset a project's adverse impacts. However, previous transplantation efforts to mitigate for the loss of seagrass beds have failed (Fonseca *et al.*, 1998). The feasibility of transplanting Johnson's seagrass is currently being examined. Environmental degradation and seagrass habitat loss continue still, despite the existing Federal and Florida State laws aimed to conserve and protect seagrass habitat.

Coastal navigation dredging projects must meet the state water quality standards with the associated reasonable assurances. Turbidity standards and other requirements to protect

environmental resources are mandatory. Pipeline dredges are used for most projects in the IWW to avoid turbidity and to allow dredge spoil placement on confined upland disposal sites. Pipeline placement and anchoring of dredges in seagrass is not allowed. The same strict water quality criteria are in place for hopper or clam shell dredges when used. Florida requires the COE to limit turbidity and sedimentation to areas within a designated mixing zone at the site of dredging. Silt curtains and other measures to contain sediments are required.

In order to design projects to avoid or minimize impacts on seagrasses, the COE uses existing surveys and maps of seagrass areas, information collected during Fish and Wildlife Coordination Act activities, aerial surveys, ground truthing, and additional field surveys, as necessary. For new (i.e., not maintenance) dredging, the COE will ensure that a more definite determination of the presence and abundance of seagrasses within inlets and critical habitat is identified. Pre-dredging seagrass surveys for Johnson's seagrass will be incorporated into both maintenance and new dredging projects for the inlets and IWW.

The following conditions have been required for all COE maintenance dredging projects within the range of Johnson's seagrass since 1996. While similar requirements have been made on regulatory permits, these more standardized conditions will be adapted for future dredging permits:

1. The contractor shall instruct all personnel associated with the project of the presence of seagrasses, especially the threatened Johnson's seagrass (*Halophila johnsonii*) and the need to avoid contact with seagrasses.
2. All construction personnel shall be advised that there are civil and criminal penalties for harming or destroying seagrasses, especially Johnson's seagrass, which is protected under the ESA, as amended.
3. The contractor shall limit pipeline and dredge anchorage such that contact with and impacts to seagrasses are avoided.

No post-dredging monitoring is required to evaluate the effects of dredging on seagrasses. However, COE projects are attended by COE dredge observers and COE permitted projects have monitoring and reporting requirements associated with them.

III. Status of the Species

The following endangered (E) and threatened (T) marine mammal, sea turtle, and marine plant species under the jurisdiction of NMFS are known to occur in or near the action area:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Johnson's seagrass	<i>Halophila johnsonii</i>	T
Loggerhead sea turtle	<i>Caretta caretta</i>	T
Green sea turtle	<i>Chelonia mydas</i>	E/T*
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E
Northern right whale	<i>Eubalaena glacialis</i>	E
Humpback whale	<i>Megaptera novaeangliae</i>	E

*Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the populations away from the nesting beaches, green turtles are considered endangered wherever they occur in U.S. waters.

Incorporation by reference of the NMFS September 25, 1997, Regional Biological Opinion on COE hopper dredging in SEUS

As noted previously, pipeline and clam shell dredges are the primary dredge plants used for the dredging projects considered in this Opinion. Hopper dredges are limited to waters over 25-feet deep, principally to entrance channels, inlets, harbors, and bays, because their large size, draft, and limited maneuverability preclude their use in the narrow, shallow, constricted waters of the IWW, and partly because it is cheaper to operate pipeline and clamshell dredges in the IWW. Thus, it is very unlikely that Johnson's seagrass would be directly impacted by hopper dredging activity since Johnson's seagrass is depth-limited and is not found where hopper dredges might safely operate. It could be present in the shallow waters adjacent to and along the edges of deeper, maintained channels and inlets and could be impacted by sloughing of the sides and edges of these channels.

Except for Johnson's seagrass, the principal dredging methods used in the proposed action, clamshell and pipeline dredging, preclude the possibility of adverse effects to the species listed above. NMFS investigated and determined (NMFS, 1991) that dredging with clamshell or pipeline dredges is unlikely to result in take of sea turtles. Clamshell dredges are the least likely to adversely affect sea turtles because they are stationary and impact very small areas at a given time.

Observer coverage at pipeline outflows of several southeast dredging projects and hundreds of hours of informal observation by COE inspectors have documented no take of marine turtles. Currently, the NMFS, Southeast Region, concludes on an "informal" basis all ESA consultations involving solely pipeline, cutterhead, or clamshell type dredging (except when Johnson's seagrass is present) because no adverse effects to any other listed species are anticipated from the use of these dredge types.

There is a possibility that sea turtles could be affected by the proposed action through the use of a hopper dredge in deep waters (over 25 feet) at the Miami Harbor, Port Everglades, Fort Pierce Harbor, and Palm Beach Harbor. Formal biological opinions for Federal hopper dredging activities in the Southeast United States (SEUS) (incorporating the entire range of Johnson's

seagrass) have been completed for impacts to marine turtles, shortnose sturgeon, and whales. The 1991, 1995, and 1997 Regional Opinions on hopper dredging activities in the SEUS (including maintenance dredging projects) established expected take of marine turtle species from entrainment in hopper dredge suction dragheads and are herein incorporated by reference. Currently, most COE dredging projects in the SEUS are routinely conducted “informally” by NMFS, Southeast Region, simply referencing the ITS and terms and conditions of the 1997 Regional Opinion to the COE South Atlantic Division. The 1997 Regional Opinion established an anticipated annual take of up to 35 loggerheads by injury or mortality, as well as 7 Kemp's ridleys, 7 green turtles, 2 hawksbills, and 5 shortnose sturgeon.

The above-listed sea turtle species are not expected to be adversely affected by pipeline or clamshell dredges, the predominant dredge types used for the proposed action, for the reasons previously stated. However, there is a small but not discountable possibility that these species may be adversely affected by the use of a hopper dredge in the limited areas and within the narrow range of Johnson's seagrass where hopper dredges are used. According to the COE (Dugger pers. comm., 2000), the hopper dredge is likely to be used in portions of the Miami Harbor, Port Everglades, Palm Beach Harbor, and the Fort Pierce Harbor maintenance projects where water depths exceed 25 feet and economic and safety considerations dictate its use. As noted above, however, the 1997 Regional Opinion established an ITS for marine turtle species for hopper dredge activities in the SEUS, *including where they might be found in the range of Johnson's seagrass*. The 1997 Opinion already addresses all hopper dredging (including maintenance and new dredging, in channels, inlets, bays, and IWW) within the SEUS from North Carolina through Key West, Florida, and already includes *all dredging that takes place within the entire range of Johnson's seagrass*. Since no additional take is expected beyond that already considered and since NMFS has no new information which might indicate that the 1997 Opinion is no longer valid, no useful purpose is served by repeating here those earlier analyses of effects. Therefore, the 1997 Opinion and analysis of effects of hopper dredging on sea turtles and shortnose sturgeon, including species descriptions and environmental baseline, is incorporated herein by reference. These five sea turtle species and the shortnose sturgeon will not be discussed further in this Opinion.

The two species of endangered marine mammals listed above—the humpback whale and the Northern right whale—may be found seasonally in the inshore waters of the SEUS but are very unlikely to occur in the action area. These species are also not expected to be affected by the action and, therefore, will also not be considered further in the consultation.

The remainder of this consultation will focus on Johnson's seagrass as the only federally-listed species likely to be affected by the action, not previously considered.

Johnson's Seagrass (*Halophila johnsonii*)

A. Species Description

Johnson's seagrass was listed as threatened under the ESA on September 14, 1998, based on the results of field work and a status review initiated in 1990, and is the first marine plant ever listed. Kenworthy (1993, 1997) and Kenworthy *et al.* (1999) discuss the results of the field studies and summarize an extensive literature review and associated interviews regarding the status of Johnson's seagrass.

Range

The species has only been found growing along approximately 200 km of coastline in southeastern Florida between Sebastian Inlet, Indian River County to northern Key Biscayne. This narrow range and apparent endemism indicate that Johnson's seagrass has the most limited geographic distribution of any seagrass in the world. Surveys conducted by NMFS and Florida staff in Biscayne Bay, Florida Bay, the Florida Keys, outer Florida Bay, Puerto Rico, and the Virgin Islands provided no verifiable sightings of Johnson's seagrass outside of the range already reported (Kenworthy *et al.*, 1999; Kenworthy, 1997). Johnson's seagrass occurs in dynamic and disjunct patches throughout its range. Growth appears to be rapid and leaf pairs have short life spans while horizontally spreading from dense apical meristems (Kenworthy, 1997). Kenworthy suggested that horizontal spreading rapid growth pattern and a high biomass turnover could explain the dynamic patches observed in distribution studies.

Extent of critical habitat

The northern and southern ranges of Johnson's seagrass are defined as Sebastian Inlet and central Biscayne Bay, respectively. Within this range, ten areas have been designated as critical habitat for Johnson's seagrass (65 FR 17786, April 5, 2000)(Attachment 2). These ten areas include: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay.

B. Life History

Reproductive strategy

Johnson's seagrass is a perennial plant with no strong seasonal pattern in all years, although it generally exhibits some winter declines (NMFS, 2000). The species grows vegetatively and sexual reproduction in Johnson's seagrass has not been documented. Female flowers have been found; however, dedicated surveys in the Indian River Lagoon have not discovered male flowers, fertilized ovaries, fruits, or seeds either in the field or under laboratory conditions (Jewett-Smith *et al.*, 1997). Searches throughout the range of Johnson's seagrass have produced the same results, suggesting that the species does not reproduce sexually or that the male flowers are difficult to

observe or describe as noted for other *Halophila* species (Kenworthy, 1997). Surveys to date indicate that the incidence of female flowers appears to be much higher near the inlets leading to the Atlantic Ocean, suggesting that inlet conditions are qualitatively better for flowering than conditions further inshore (Kenworthy pers. comm., 1998). It is possible that male flowers, if they exist, occur near inlets as well. Maintenance of good water quality around inlets may be essential for promoting flowering in the Johnson's seagrass population.

Niche

Critical environmental factors to support seagrasses include, but are not restricted to: light, temperature, salinity, and unconsolidated sediments. Where *H. johnsonii* grows, conditions usually include light levels maintained at a minimum of 10 percent surface incident light, salinity of at least 15 parts per thousand (ppt), water temperature between 10° C and 35° C, and sediments that are unconsolidated sand or sand mixed with silt and clay. The effects of short-term poor conditions (i.e., low light or poor water quality) on *H. johnsonii* are currently unknown. Water transparency appears to be critical for Johnson's seagrass, limiting its distribution at depth to areas of suitable optical water quality (Kenworthy, 1997). In areas in which long-term poor water and sediment quality have existed until recently, such as Lake Worth Lagoon, *H. johnsonii* appears to occur in relatively higher abundance, perhaps due to the previous inability of the larger species to thrive. These studies support unconfirmed previous observations that suspended solids and tannin, which reduce light penetration and water clarity, may be important factors limiting seagrass distribution in the Indian River Lagoon (Woodward-Clyde, 1994). Good water clarity is essential for *H. johnsonii* growth in deeper waters.

Johnson's seagrass occurs over varied depths, environmental conditions, salinities, and water quality. In tidal channels *H. johnsonii* is found in coarse sand substrates, although it has been found growing on sandy shoals and in soft mud near canals and rivers where salinity may fluctuate widely (Virnstein *et al.*, 1997). Virnstein has called Johnson's seagrass a "perennial opportunistic species." Within his study areas in the Indian River Lagoon, *H. johnsonii* was found by itself, with other seagrass species, in the intertidal, and (more commonly) at the deep edge of some transects in water depths of up to 180 cm. *Halophila johnsonii* was found shallowly rooted on sandy shoals, in soft mud, near the mouths of canals, rivers, and in shallow and deep water (Virnstein *et al.*, 1997). Additionally, recent studies have documented large patches of Johnson's seagrass on flood deltas just inside Sebastian Inlet, as well as far from the influence of inlets (reported at the workshop discussed in Kenworthy, 1997). These sites encompass a wide variety of salinities, water quality, and substrates.

Competitors

Halophila johnsonii appears to be outcompeted in ideal seagrass habitats where environmental conditions permit the larger species to thrive (Virnstein *et al.*, 1997; Kenworthy, 1997).

C. Population Dynamics

Population stability

A factor leading to the listing of *H. johnsonii* is its rareness within its extremely restricted geographic range. Johnson's seagrass is characterized by small size (it is the smallest of all of the seagrasses found within its range, averaging about 3 cm in height), fragile rhizome structure and associated high turnover rate, and its apparent reliance on vegetative means to reproduce, grow, and migrate across the sea bottom. These factors make Johnson's seagrass vulnerable to human or environmental impacts by reducing its capacity to repopulate an area once removed. The species and its habitat are impacted by human-related activities throughout its range, including bridge construction and dredging, and the species' threatened status produces new and unique challenges for the management of shallow submerged lands. Vessel traffic resulting in propeller and anchor damage, maintenance dredging, dock and marine construction, water pollution, and land use practices could require special management within critical habitat.

Population (genetic) variability

Preliminary surveys using Randomly Amplified Polymorphic DNA (RAPD) analyses indicate that there are small, isolated populations of *H. johnsonii* that have clones which are genetically distinct from clones at other locations (Freshwater, 1999). Two populations in the more southerly range of the species, one from near Boynton Beach and a second population from Boca Raton, exhibit higher genetic variability than populations from the central (Jupiter Inlet) and northern range (Fort Pierce Inlet, Johns Island, Sebastian Inlet) of the species examined to date (Kenworthy *et al.*, 1999). A site in each of these populations has been designated as critical habitat. These two sites represent a genetically semi-isolated group which could be the reservoir of a large part of the overall genetic variation found in the species. Information is still lacking on the geographic extent of this genetic variability.

D. Status and Distribution

Reasons for listing

Kenworthy *et al.* (1999) summarized the most recent information on Johnson's seagrass biology, distribution, and abundance and confirmed the limited range and rareness of this species within its range. Additionally, the apparent restriction of propagation to vegetative means suggests that colonization between broadly disjunct areas is likely difficult, suggesting that the species is vulnerable to becoming endangered if it is removed from large areas within its range by natural or anthropogenic means.

Anthropogenic impacts

Human impacts to Johnson's seagrass and its habitat include: (1) vessel traffic and the resulting propeller dredging and anchor mooring; (2) dredging; (3) dock and marina construction and shading from these structures; (4) water pollution; and (5) land use practices including shoreline development, agriculture, and aquaculture.

Activities associated with recreational boat traffic and dock construction account for the majority of human use associated with the designated critical habitat areas. The destruction of the benthic community due to boating activities, propeller dredging, anchor mooring, and dock and marina construction was observed at all sites during a study by NMFS from 1990 to 1992. These activities severely disrupt the benthic habitat, breaching root systems, severing rhizomes, and significantly reducing the viability of the seagrass community. Propeller dredging and anchor mooring in shallow areas are a major disturbance to even the most robust seagrasses. This destruction is expected to worsen with the predicted increase in boating activity. Trampling of seagrass beds, a secondary effect of recreational boating, also disturbs seagrass habitat. Populations of Johnson's seagrass inhabiting shallow water and water close to inlets, where vessel traffic is concentrated, will be most affected.

The constant sedimentation patterns in and around inlets require frequent maintenance dredging, which could either directly remove essential seagrass habitat or indirectly affect it by redistributing sediments, burying plants and destabilizing the bottom structure. Altering benthic topography or burying the plants may remove them from the photic zone. Permitted dredging of channels, basins, and other in- and on-water construction projects cause loss of Johnson's seagrass and its habitat through direct removal of the plant, fragmentation of habitat, and shading. Docking facilities that, upon meeting certain provisions, are exempt from state permitting also contribute to loss of Johnson's seagrass through construction impacts and shading. Fixed add-ons to exempt docks (such as finger piers, floating docks, or boat lifts) have recently been documented as an additional source of seagrass loss due to shading (Smith and Mezich, 1999).

Decreased water transparency caused by suspended sediments, water color, and chlorophylls could have significant detrimental effects on the distribution and abundance of the deeper water populations of Johnson's seagrass. A distribution survey in Hobe and Jupiter Sounds indicates that the abundance of this seagrass diminishes in the more turbid interior portion of the lagoon where reduced light limits photosynthesis.

Other areas of concern include seagrass beds located in proximity to rivers and canal mouths where low salinity, highly colored water is discharged. Freshwater discharge into areas adjacent to seagrass beds may provoke physiological stress upon the plants by reducing the salinity levels. Additionally, colored waters released into these areas reduce the amount of sunlight available for photosynthesis by rapidly attenuating shorter wavelengths of Photosynthetically Active Radiation.

Continuing and increasing degradation of water quality due to increased land use and water management threatens the welfare of seagrass communities. Nutrient over-enrichment caused by inorganic and organic nitrogen and phosphorous loading via urban and agricultural land run-off stimulates increased algal growth that may smother Johnson's seagrass, shade rooted vegetation, and diminish the oxygen content of the water. Low oxygen conditions have a demonstrated negative impact on seagrasses and associated communities.

A wide range of activities funded, authorized, or carried out by Federal agencies may affect the essential habitat requirements of Johnson's seagrass. These include authorization by the COE for

beach nourishment, dredging, and related activities including construction of docks and marinas; bridge construction projects funded by the FHWA; actions by the U.S. Environmental Protection Agency and the COE to manage freshwater discharges into waterways; regulation of vessel traffic by the U.S. Coast Guard; management of national refuges and protected species by the U.S. Fish and Wildlife Service; management of vessel traffic (and other activities) by the U.S. Navy; authorization of state coastal zone management plans by NOAA's National Ocean Service; and management of commercial fishing and protected species by NMFS.

Rangewide trend

Currently, there is no apparent pattern of increase or decrease in abundance or geographic range of Johnson's seagrass (through 1999) (Johnson's Seagrass Recovery Team, 2000). The species was first described in 1980 and has only been extensively studied during the 1990s. Generally, seagrasses within the range of Johnson's seagrass have declined in some areas and increased in others. Where multi-year mapping studies have been conducted within the Indian River Lagoon, recent increases in Johnson's seagrass have been noted but may be attributed in part to the recent increase in search effort and increased familiarity with this species (Virnstein *et al.*, 1999).

E. Analysis of the Species Likely to be Affected

Halophila johnsonii may be affected because of its limited range, distribution within its range, reproductive capacity, and largely unknown ability to recover from removal from a site. Spread of the species into new areas is limited by its reproductive potential. Johnson's seagrass is thought to possess only female flowers; thus, vegetative propagation, most likely through asexual branching, appears to be its only means of reproduction and dispersal. If an established community is removed, regrowth and re-establishment are unlikely. If extirpated from an area, it is doubtful that the species would be capable of repopulation. This species' method of reproduction impedes the ability to increase distribution as establishment of new vegetation requires considerable stability in environmental conditions and protection from human-induced disturbances.

IV. Environmental Baseline

A. Factors Affecting the Species Environment within the Action Area

The entire range of Johnson's seagrass, from Sebastian Inlet through Biscayne Bay, is within the action area being considered in this Opinion. This seagrass occurs within inshore waters of the most populated counties in Florida, and is therefore influenced by numerous actions and potential sources of harm. Since 1981, the state of Florida has regulated activities that affect seagrasses and has implemented measures to minimize these effects. These protective measures directly benefit Johnson's seagrass.

Inlets into the IWW have been established or stabilized and maintained since the early 1900s, in some cases creating a marine environment where freshwater once occurred. Naturally-occurring channels have been expanded, deepened, and stabilized into continuous channels with access to

harbors and inlets. These activities have had a dominant effect on the seagrass habitat throughout the range of *H. johnsonii*.

Urban development since the 1960s has affected inshore water quality throughout the range of Johnson's seagrass. However, Woodward-Clyde (1994) opined that improvements in erosion and sediment control in association with urban development in the 1980s and 1990s may have been responsible for reduced turbidity in those decades as compared to the previous two decades of development. Reductions in seagrasses were apparent in the 1970s, along with areas of highly turbid water. Increases in submerged aquatic vegetation were noted until coverage and density peaked in 1986, albeit at levels remaining below those observed in the decades prior to 1960.

In association with upland development, water quality and transparency within the range of Johnson's seagrass are affected by storm water and agricultural run-off, wastewater discharges, and other point and nonpoint sources. The effects of water management may result in large discharges of fresh water from Lake Okeechobee. Nutrient overenrichment resulting from these discharges may stimulate increased algal growth that may smother seagrasses, shade rooted vegetation, and diminish the oxygen content of the water. Water clarity, which has been identified as an essential feature to allow Johnson's seagrass to occur in the deeper reaches of its range, may also be affected by these discharges. Although Johnson's seagrass has shown tolerance of wide salinity ranges, the discharge of large amounts of fresh water into the IWW may exceed even these ranges.

Increasing recreational vessel traffic in the range of Johnson's seagrass results in marina and dock construction, anchor mooring, propeller scoring and scouring by vessels operating outside of boat channels, and intentional, illegal propeller dredging. Additionally, seagrass beds may be trampled by fishermen and others using these inshore waters. These activities disrupt the benthic habitat and easily breach the shallow root systems of Johnson's seagrass.

Natural disasters, including hurricanes and large coastal storms, could also significantly harm seagrass beds. Storm surges could easily pull the shallowly rooted *H. johnsonii* from the sediments and remove a large portion of its population in proximity to inlets. Because of its restricted geographic distribution and apparent reliance on asexual reproduction, it is less likely to survive environmental perturbations and to be able to repopulate an area when lost.

V. Effects of the Action

The best available information, including the status reviews and the information included in the studies cited in the bibliography, was used to evaluate the effects of maintenance dredging on Johnson's seagrass. The COE conducts or permits maintenance dredging for nine coastal navigation projects and a number of small municipal, private, or commercial entities within the range of Johnson's seagrass. The COE is required by the state of Florida to minimize the impacts of these maintenance dredging projects on seagrasses. All dredging projects must be designed and carried out in a manner that avoids effects on seagrasses, minimizes those effects if they cannot be avoided, and mitigates unavoidable effects if more than a fraction of an acre of seagrass is

destroyed by a project. Thus, even when not specifically identified, Johnson's seagrass has been receiving some protection since the early 1980s when the state of Florida began implementing these general seagrass protection measures.

The COE modified their seagrass protection conditions for COE coastal navigation projects to inform operators conducting projects within the range of Johnson's seagrass that they were prohibited from harming or destroying seagrasses and could not lay pipeline and anchors into seagrasses. COE inspectors, required on all COE construction projects, are responsible for ensuring that these conditions, as well as turbidity restrictions established by the state, are being met.

Maintenance dredging permits

Maintenance dredging projects requiring regulatory permits are also conditioned to prohibit effects to seagrasses in most cases. Historically, the permits issued that allowed the removal of seagrasses also required mitigation to develop seagrass beds of similar value. Monitoring of the effects of the projects and any associated mitigation measures was also required. Even with extensive cooperative efforts among the resource agencies, carefully designed mitigation for seagrass loss was unsuccessful. This lack of success at mitigation, along with the state's seagrass protection requirements, contributed to the COE's current policy of rarely issuing maintenance dredging permits that allow the dredging of seagrasses. The last regulatory permit issued for maintenance dredging that authorized effects to seagrasses was issued in 1990 and expired in 1998. There is no information to determine whether Johnson's seagrass may have been among the grasses impacted by that project.

The COE and the state of Florida have not yet required monitoring of the effects of dredging on seagrasses; therefore, direct observations of maintenance dredging on Johnson's seagrass are not available. Future monitoring will be necessary to support the findings of this Opinion and to allow the COE to better carry out their ESA section 7 responsibilities. Project monitoring will provide COE and NMFS with information essential to quantifying the effects of maintenance dredging on Johnson's seagrass and its designated critical habitat. Monitoring will provide data necessary to refine this Opinion, future biological opinions on other COE actions (including new dredging of the IWW and activities issued under individual permits), and to assist in the recovery planning process. A COE monitoring program is necessary and must be designed to detect adverse effects of maintenance dredging and other COE actions, assess trends in the effects, determine when there are adverse impacts beyond those considered in this Opinion, and determine the effectiveness of programs implemented to avoid impacts on seagrasses, particularly Johnson's seagrass. To assist the COE and other agencies with a seagrass monitoring program the Recovery Team developed recommendations for surveying for Johnson's seagrass at various-sized project sites.

The COE performed a pre-dredging seagrass survey through sections of the IWW in Palm Beach County from August 24 to September 3, 1999 in anticipation of new dredging to widen and deepen the IWW around the Lake Worth Inlet (COE, 2000). If Johnson's seagrass was present along a transect, it was most commonly located in shallow depths from 1 to 3 m and on the shelf slope at the edge and sides of the channel. The species rarely occurred in the center of coastal navigation

channels; however, results of the COE's survey identified the presence of *H. johnsonii* (mixed with *H. decipiens*) at a few sites in the IWW channel in Lake Worth and west of the Boynton Inlet at depths of 3.5 - 5 m (11.5 - 14.8 feet).

The maintained portions of the IWW from Fort Pierce north are maintained at depths of 12 feet (less than 4 m). Below Fort Pierce, the maintained portions of the IWW are generally 10-feet deep (3 m). Harbors and turning basins associated along the IWW are generally much deeper than the channels. Because these areas are heavily trafficked and are dredged every three to five years, establishment of Johnson's seagrass patches at that depth and in these areas is improbable. However, improvements to water quality and clarity may explain the occurrence of Johnson's seagrass at greater depths. Additionally, increased survey effort may continue to document Johnson's seagrass in deeper waters.

Dredging effects

The stabilization and maintenance of channels and harbors, whether originally manmade or natural, are likely affecting the distribution of Johnson's seagrass by interrupting horizontal spreading. Johnson's seagrass seems particularly well adapted to rapid horizontal spreading throughout its range due to its dense apical meristems and high turnover. Without human intervention, such spreading would be interrupted or modified primarily by natural changes in water depths, water clarity, and competition with other grasses for habitat. Throughout the range of Johnson's seagrass, including the areas within proposed critical habitat, water depth and clarity are controlled by anthropogenic influences. Channels, harbors, and small projects maintained over long periods likely interrupt the horizontal migration or spreading of Johnson's seagrass, controlling, and limiting its current distribution and abundance. Because the environmental baseline has been compromised throughout the range of Johnson's seagrass since the species was first described, it is impossible to fully evaluate how anthropogenic actions such as maintenance dredging have affected the abundance and distribution of Johnson's seagrass.

Johnson's seagrass is likely to be adversely affected by maintenance dredging in the areas adjacent to the channels, harbors, and private or commercial dredging projects. Sloughing of seagrasses along the sides of these projects could occur when material is removed from channels, harbors, and other maintained sites. Because Johnson's seagrass occurs at the deeper range of seagrass beds, it may occur within this band of grass vulnerable to sloughing into the dredged areas. Grasses sliding into the deeper channels are not likely to survive due to damaged leaves and roots or burial. While COE staff believe that sloughing is unlikely or rare, until pre- and post-dredging monitoring is required there is no way to determine how often and to what extent sloughing may occur, or how much Johnson's seagrass is affected.

Other impacts to Johnson's seagrass may occur. *Halophila johnsonii*'s small root-rhizome structures grow shallowly upon the sediment. Turbulence caused indirectly by dredging activities, pipeline placement, and support vessels could pull Johnson's seagrass from the sediment. Additionally, despite all precautions, turbidity may be caused by dredging or by subsequent use of the channel by vessel traffic. Reduced water clarity caused by turbidity also limits the depths at

which Johnson's seagrass can thrive. Sediments suspended by dredging can also bury Johnson's seagrass, which decomposes rapidly due to its small size and fragile nature.

Paradoxically, the effects of maintenance dredging of areas near the inlets could have the greatest positive or negative impacts on the vigor and diversity of Johnson's seagrass. Flood tide deltas, which provide habitat for Johnson's seagrass, can become reconfigured due to increased flows caused by the removal of shoals and reestablishment of project depths by maintenance dredging. Increased flow in the IWW improves water quality and clarity, resulting in improved conditions for Johnson's seagrass and other seagrasses. The incidence of female flowers within Johnson's seagrass patches appears to be highest near inlets, prompting researchers to theorize that male flowers, if they exist, likely also occur near inlets (Kenworthy pers. comm., 1998). Maintenance of good water quality around inlets, without dredging in a manner that removes seagrasses, may be essential for promoting flowering in the Johnson's seagrass population.

Protective measures

The COE's protective measures likely reduce the direct effects of maintenance dredging on Johnson's seagrass for those projects conducted by the COE. Inspectors conduct site visits periodically during dredging operations to document adherence to permit conditions. However, surveys before and after dredging to assess the precise effects of maintenance dredging on the distribution and abundance of seagrasses have not been designed or required. Because maintenance dredging occurs regularly, Johnson's seagrass is exposed to the threats listed above frequently--annually at some sites, and every two to five years at others. Some destruction and removal of Johnson's seagrass is likely occurring through sloughing, burial, turbidity, and water quality effects. Loss of seagrasses near inlets could affect the diversity and vigor of the Johnson's seagrass population. The total quantity of *H. johnsonii* lost cannot be calculated with the best currently available information. Monitoring of maintenance dredging projects is needed to provide COE, NMFS, and the state of Florida with data to quantify the impacts of maintenance dredging.

Trends and changes in Johnson's seagrass distribution and abundance

Even in a pristine, natural environment, the distribution and abundance of seagrasses may change rapidly due to seasonal fluctuations in environmental conditions and natural stochastic events such as hurricanes. Therefore identifying changes in seagrass distribution and abundance is difficult, and attributing overall changes to a particular action may be impossible. Results of some of the recent studies done specifically on Johnson's seagrass were summarized in Kenworthy (1997). The studies identify declines in Johnson's seagrass in some areas, increases in others, with an apparent steady trend overall. This is consistent with preliminary data regarding seagrasses, generally, within two areas in the range of Johnson's seagrass. Analytical photogrammetry was applied to aerial photographs from 1988 and 1996 to map and compare the distribution and relative density of seagrasses from Jupiter to St. Lucie Inlet in those two years (Finkbeiner, pers. comm., 1998). The photographs are being analyzed for changes in the distribution and abundance of patchy and dense seagrasses. Although the same techniques were used in both years, better mapping capabilities in 1996 may cause some spatial offsetting, and in some cases submerged algae mixed in the seagrasses may confound the descriptions of seagrass beds. Keeping in mind those caveats, the preliminary draft analysis of the photographs indicate a net loss of about three

hectares of seagrasses in 1996 compared to 1988. About 95 percent of the patchy areas were different between the two years, and 25 percent of the densely covered areas were different between the two years. There is no information to suggest what the change rates would be in a natural system between those two years. Further analyses may modify the conclusions of this analysis.

These studies illustrate changes in the distribution and abundance of Johnson's seagrass and perhaps a small net loss in the relative occurrence of seagrasses within the range of Johnson's seagrass in recent years. Maintenance dredging has been ongoing in the vicinity of these studies, and seagrass protection measures have been implemented throughout this period. There is insufficient information to determine whether these protective measures have been completely effective in protecting Johnson's seagrass or in preserving seagrass populations by preventing direct removals and maintaining or improving water quality. The extent of the contribution of other anthropogenic and natural factors to the trends in seagrass abundance and distribution identified in these studies further confounds any ability to assess the effects of maintenance dredging on Johnson's seagrass. However, the apparent relative stability in the overall abundance of Johnson's seagrass throughout its range and the apparent ability of this species to spread rapidly in some areas and seasons despite ongoing anthropogenic activities, including maintenance dredging, suggests that maintenance dredging is being conducted in a manner that is not preventing the recovery or survival of Johnson's seagrass. Direct takes by maintenance dredging are not likely under current conditions which prohibit pipeline and anchor placement on seagrasses as well as direct dredging of seagrasses. Indirect effects caused by sloughing or effects to water quality are likely. However, general preliminary seagrass studies suggest that Johnson's seagrass is persisting and appears to be resilient to the effects of maintenance dredging as currently performed and tempered by current protective practices.

Effects to critical habitat

Critical habitat includes specific areas within the range of a species in which there are features essential to the conservation of the species that may require special management considerations. Areas outside of a species' current range may also be listed if they are essential for the conservation of the species. Six of the maintenance dredging projects conducted or permitted by COE occur in or are adjacent to Johnson's seagrass critical habitat. The features that have been identified as essential components of critical habitat include water quality, salinity, water transparency, and stable, unconsolidated sediments. As discussed above, these essential features may be affected by maintenance dredging, although existing practices including strict turbidity restrictions in the vicinity of seagrasses reduce the extent of effects. Dredging of inlets may increase flow and improve water quality and transparency. Generally, Johnson's seagrass appears to be more opportunistic than was previously realized, and has been identified under varying environmental conditions, depths, salinities, and water qualities (Virnstein *et al.*, 1997). In sum, the possible effects of maintenance dredging on the constituent elements of critical habitat do not appear to diminish the capability of existing habitat to satisfy the essential requirements of this species. Maintenance dredging, even when considered along with the compromised environmental baseline under which Johnson's seagrass exists, does not appear to be appreciably reducing the value of critical habitat in a manner that prevents survival and recovery of this species. Therefore,

NMFS believes that continued maintenance dredging, as described in the Proposed Action section of this biological opinion, may affect but is not likely to destroy critical habitat.

Direct observations of Johnson's seagrass and its critical habitat before and after maintenance dredging projects have not been conducted. Long-term surveys documenting the overall trends in abundance and distribution of Johnson's seagrass have also not been conducted. The conclusions of this Opinion are based on general observations of the nature of Johnson's seagrass, trends in certain nonrandom transect surveys, and an analysis of the overall abundance of seagrasses within the range of Johnson's seagrass. Given the scarcity of precise information on the effects of ongoing maintenance dredging on Johnson's seagrass, continued and improved monitoring of dredging sites prior to and after construction is necessary to confirm our determinations.

VI. Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in the biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation or conference pursuant to section 7 of the Act.

Increasing recreational vessel traffic in the range of Johnson's seagrass is likely to result in marina and dock construction, vessel anchoring, propeller scoring by vessels operating outside of boat channels, and illegal propeller dredging. Trampling by fishermen and others using inshore waters between Sebastian Inlet and Biscayne Bay is likely. Natural disasters, including hurricanes and large coastal storms, could also significantly harm seagrass beds.

Besides direct losses from construction or dredging activities, there are cumulative and permanent losses to sea grasses, including Johnson's seagrass due to perpetual shading and fragmentation of submerged lands. For example, there are numerous Federal Highway Administration/Florida Department of Transportation bridge replacements and new bridge projects that are underway or proposed within the range of Johnson's seagrass. Impacts to Johnson's seagrass from single-family docks, exempt from the state permitting process (Smith and Mezich, 1999), also contribute to the cumulative effects. The quantity of bridge projects, maintenance dredging projects, and individual COE-permitted projects taking place year-after-year in the range of Johnson's seagrass will have a cumulative effect on the species.

VII. Conclusion

After reviewing the current status of Johnson's seagrass, the environmental baseline for the action area (which is the range of the species), the effects of maintenance dredging of coastal navigation projects and projects authorized by regulatory permits, and the cumulative effects, it is NMFS's opinion that the maintenance dredging of coastal navigation projects and projects authorized by regulatory permits, as proposed, are not likely to jeopardize the continued existence of Johnson's seagrass and are not likely to destroy or adversely modify designated critical habitat. Existing efforts to avoid wherever possible, or minimize the effects of maintenance dredging on seagrasses in Florida waters, afford some protection to Johnson's seagrass. Some effects to Johnson's seagrass, including effects to important characteristics of designated critical habitat, are caused by sloughing, turbulence, turbidity, damage caused by pipeline placement, and changes in tidal flow due to maintenance dredging. Despite these effects, along with the baseline and the cumulative effects, recent surveys have indicated that Johnson's seagrass does not currently appear to be declining within its restricted range. Further surveys and monitoring of maintenance dredging projects before and after dredging is necessary to quantify the effects of these projects and to verify the conclusion of this Opinion. This concludes the biological opinion for maintenance dredging of coastal navigation projects and projects authorized by regulatory permits by the COE within the range of Johnson's seagrass.

VIII. Conservation Recommendations

1. The COE should develop and incorporate a standardized method to conduct pre- and post-dredging surveys aimed at evaluating the effects of maintenance dredging specifically on Johnson's seagrass or adopt those guidelines developed by the Johnson's Seagrass Recovery Team. Survey design should be developed to consider the perennial nature and small size of this seagrass. Seasonal survey parameters (early summer surveys), increased ground truthing to support the presence or absence of Johnson's seagrass specifically, and collection of sediments to improve the likelihood of detection of rhizomes may be required for these specific surveys. Additionally, field identification techniques should be taught to COE biologists and inspectors tasked with conducting surveys or verifying adherence to permit conditions.
2. The COE should complete pre-dredging surveys (and post-dredging surveys as feasible) for each of the maintenance dredging projects considered in this Opinion using the standardized methods mentioned above and providing the following deliverables: a) amount (acres or square meters) impacted, b) estimate of percent coverage and the species present/absent, c) site map with seagrass patch or bed locations, d) size of the patches, and e) shoot density estimate.
3. Although male flowers have not been found for Johnson's seagrass, the flowering populations have been primarily found associated with inlets (Kenworthy per comm., 1998). If male flowering *H. johnsonii* exist, they are also likely associated with inlets; therefore, surveys of these inlet areas should be conducted or supported by COE following the survey parameters developed above to ensure that these essential *H. johnsonii* populations are not removed. This

will support ongoing maintenance work that may affect flow at inlets, as well as any future work to widen and deepen channels at inlets.

4. The COE, in coordination with seagrass researchers and with industry, should support ongoing research on light requirements and transplanting techniques to preserve and restore Johnson's seagrass.
5. The COE should participate with the St. Johns River Water Management District's ongoing efforts to preserve and restore seagrass, and should participate in the implementation of the Seagrass Preservation and Restoration Plan for the Indian River Lagoon.
6. The COE should prepare an assessment of the effects of other actions under their purview, including new dredging projects, the discharge of water through the canals from Lake Okeechobee, and dock and marina construction (IP and LOP) permits, on Johnson's seagrass for consideration under future consultations. The standardized surveys identified in number 1, above, should be used to collect data to support assessments of these new dredging projects.

IX. Reinitiation of Consultation

The COE must request reinitiation of consultation if: (1) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (2) the action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; (3) a new species is listed or critical habitat designated that may be affected by the action.

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Table 1. Coastal Navigation Projects conducted, permitted, or anticipated by the COE within the range of Johnson's seagrass

PROJECT NAME	TYPE OF PROJECT	LAST YEAR DREDGED	SPECIAL CONDITIONS	Adjacent to or in CRITICAL HABITAT?	CONSIDERED IN THIS CONFERENCE?
IWW near Miami Harbor	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	Yes	No
Miami Harbor	New deepening project	Ongoing		Yes	No
IWW near Bakers Haulover Inlet	Maintenance, every 3 years	1998	No new conditions beyond those described in the proposed action.	Yes	Yes
Bakers Haulover Inlet	Maintenance, every 5 years	1998	No new conditions beyond those described in the proposed action.	Yes	Yes
IWW near Port Everglades	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
Port Everglades Harbor	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
New River	New, no current plans	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
IWW near Hillsboro Inlet	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
Hillsboro Inlet	Maintenance	Annual	No new conditions beyond those described in the proposed action.	No	Yes
IWW near Boca	New	Unknown	New surveys will be needed to determine presence and	Yes	No

Raton		n	distribution of Johnson's and other seagrasses. New EA will be necessary.		
IWW near Jupiter Inlet	Maintenance, every 3-5 years	1994	No new conditions beyond those described in the proposed action.	Yes	Yes
IWW south of Lake Worth Inlet	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	Yes
IWW near Palm Beach Harbor	Maintenance	1994	Maintenance dredging to current project depth, no new conditions beyond those described in the proposed action	No	Yes
IWW near Palm Beach Harbor	New Future Maintenance every 3-5 years	Unknown	Environmental Assessment is being drafted on the effects of construction to authorized depths on Johnson's seagrass	No	No
Palm Beach Harbor	Maintenance	Annual	No new conditions beyond those described in the proposed action.	No	Yes
Palm Beach Side Channel and Basin	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
PROJECT NAME	TYPE OF PROJECT	LAST YEAR DREDGED	SPECIAL CONDITIONS	Adjacent to or in CRITICAL HABITAT?	CONSIDERED IN THIS CONFERENCE?
IWW near St. Lucie Inlet	Maintenance, every 3 years	1996	No new conditions beyond those described in the proposed action.	Yes	Yes
St. Lucie Inlet	Maintenance, every 3 years	1995	No new conditions beyond those described in the proposed action.	Yes	Yes
IWW near Fort Pierce	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	Yes	No
Fort Pierce Harbor	Maintenance	1997	No new conditions beyond those described in the	Yes	Yes

			proposed action.		
Vero Beach Turning Basin	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	No	No
IWW near Sebastian Inlet	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	Yes	No
Sebastian Side Channel and turning basin	New	Unknown	New surveys will be needed to determine presence and distribution of Johnson's and other seagrasses. New EA will be necessary.	Yes	No

New means not done in more than 10 years or never done.

Shaded projects are not considered in this conference opinion